

DE 01-222

KW MANAGEMENT, INC.

Petition for Waiver of Puc 906.01(a)(3) - Surge Testing
Requirements Applicable to Inverter Interfaced Systems

Order Denying Petition and Opening a Rulemaking Docket
to Address Issues Related to Inverter Equipment

O R D E R N O. 24,187

June 27, 2003

I. PROCEDURAL HISTORY AND BACKGROUND

By letter petition filed with the New Hampshire Public Utilities Commission (Commission) on November 9, 2001, KW Management, Inc. (KWMI or the Petitioner) requested: a waiver of the surge testing requirements of Puc 906.01(a)(3) for certain specified inverter equipment¹, and a provision to obtain blanket waivers for new inverter equipment, as it becomes available, which complies with Institute of Electrical and Electronic Engineers, Inc. (IEEE) 929 and has been tested to Underwriters Laboratory (UL) 1741.

In support of its petition, KWMI stated that a waiver for the specified inverter equipment should be acceptable since the equipment has met the surge requirements recently set forth by the New York State Public Service Commission, among others.

¹ The waiver was requested for the following models of inverter equipment: (i) Gridtek 10kW manufactured by Xantrex, British Columbia, (ii) Sun Tie Series (1.5kW, 2.5kW) manufactured by Xantrex, and (iii) GC 1000 and GC 3000 manufactured by Advanced Energy Systems, Wilton, NH.

KWMI also stated that a waiver is necessary in order to encourage small, diversified, and grid-connected, customer-owned renewable generation. KWMI averred that the specified inverter equipment is state-of-the-art and, since the equipment is designed to operate without batteries, the equipment is the most cost effective means of utilizing renewable energy for residential customers. KWMI stated that only the Xantrex SW series, which are high-end, larger capacity (4kW-5.5kW) inverters requiring batteries, have supporting documentation showing that they meet the special New Hampshire surge test requirements. KWMI stated that these inverters are excellent products, and waiving the surge test requirements for the specified equipment would allow for customer choice and reduced cost of system installation.

Finally, KWMI urged that a waiver is necessary to encourage New Hampshire companies developing inverter equipment to continue business. KWMI stated that the financial burden on companies that must conduct multiple tests for each state or utility is unreasonably large. KWMI further stated that since UL certification takes several weeks to several months for each special test, the time to market for new products is greatly increased.

The Commission issued a secretarial letter dated January 23, 2003 that announced the Commission's determination to deny KWMI's request to obtain a blanket waiver for newly available inverter equipment. Regarding KWMI's request for a

waiver in connection with the specified models of inverter equipment, the letter asked for written comments from New Hampshire electric distribution companies, other persons interested in Puc 906.01 regarding KWMI's waiver request, and KWMI. A summary of the comments received is contained in Section II, below.

II. SUMMARY OF COMMENTS RECEIVED

Connecticut Valley Electric Company (CVEC), Granite State Electric Company (GSEC) and Unitil Energy Systems, Inc. (UES) submitted comments in response to the secretarial letter. Public Service Company of New Hampshire (PSNH) and New Hampshire Electric Cooperative (NHEC) did not submit comments for the record. Comments were also received from Global Resource Options (GRO), of Strafford, VT, KWMI, and Solar Works, Inc., of Wilton, New Hampshire.

CVEC submitted a letter to the Commission on February 6, 2003. CVEC recommended that KWMI's request be denied for three reasons:

1. Equipment must be able to operate reliably in the power system environment, where it will encounter the surges that are being tested for in Puc 906.01.
2. The safety of line workers and the public must not be compromised by use of equipment that fails to operate correctly.
3. The IEEE 929 standard (see PUC 901.01(a)(1)) will soon be replaced by the IEEE 1547 series of standards. These standards will incorporate voltage and current surge testing in accordance with IEEE/ANSI C62.41 or IEEE C37.90.01 as applicable. According to CVEC, a

comparison of these standards will show that Puc 906.01 is reflecting them as applicable.

GSEC submitted a letter to the Commission on February 6, 2003. GSEC stated it supports the development of renewable energy resources and that public safety and protection of the distribution system are of paramount concern. GSEC concluded that the surge testing requirements in Puc 906.01(a)(3) appropriately protect the public and the system. GSEC recommended that given the expiration of the grace period for non-conforming equipment (see PUC 906.01(d) and 908.09), the waiver request should be denied.

GSEC also said it is not aware that, and has not researched the question of whether, UL has delisted the specific inverters KWMI was concerned about. However, GSEC confirmed that it was aware that UL has delisted the following Xantrex inverters for not meeting the UL 1741 standard: SW 3512, SW 4024, SW 4048, and SW 5548.

UES submitted a letter to the Commission on February 6, 2003. UES noted that inverters provide protection and control of the DC generator system connected to the distribution system. According to UES, IEEE 929 and the draft standard IEEE 1547 prohibit generators from "islanding," a situation where there is separation from the distribution system and delivery of electricity to local load normally supplied by the electric distribution system. UES stated that if an inverter does not meet the surge testing criteria set forth in Puc 906, it could be

damaged by a surge on the electrical system and fail to perform the protection function as designed.

UES disputed KWMI's assertion that New Hampshire's surge testing requirement imposes an unreasonably large burden. UES stated that New Hampshire's requirement is similar to those of other states and other standards boards, and in particular it is consistent with ANSI.

UES predicted that if the Commission issues a waiver for an inverter, it would be forced to perform its own type testing again, which would be a burden on the ratepayers and the interconnection equipment. UES believes that the Puc 900 requirements are a good compilation of the concerns of all parties. UES stated that since the PUC rules were adopted, it has received and approved an increased number of interconnection applications. UES does not recommend approving a waiver.

GRO submitted a letter to the Commission on February 6, 2003. GRO's comments related to the "Xantrex SunTie inverter." GRO stated that this inverter has been tested and meets UL 1741 (see Puc 906.01(a)(2)) and IEEE 929 and based on these tests has been approved for operation in all but a few states such as New York and New Hampshire. According to GRO, thousands of these units are successfully and safely operating in the US, in areas with much more complicated distribution systems than New Hampshire's. GRO stated that the New Hampshire testing is more stringent than required and that New Hampshire's special surge test represents a significant impediment (because of the expense)

to the implementation of renewable energy in New Hampshire. At the same time, GRO stated that it believed that the SunTie inverter has been tested for New Hampshire with results submitted to the State but that no action has yet been taken.

KWMI submitted a letter to the Commission on February 18, 2003. KWMI stated that the requirements of Puc 906.01(a)(3) are special to New Hampshire and while they are similar to other states, they do require additional testing. According to KWMI, inverter manufacturers want to meet prescribed national standards and recommended practices.

KWMI included a test report from CSA International dated August 19, 2002 regarding its evaluation of Xantrex inverter Model BWT-10240, which is said to be the same as the GridTek 10kW manufactured by Xantrex for Bergey Wind Power. CSA's report provides information about the tests performed and concludes that the Xantrex inverter Model BWT-10240 has been found to be in compliance with PUC 900 interconnection requirements provided it is properly installed. KWMI stated that it had recently forwarded this information to PSNH and has confirmed that it is now acceptable to PSNH for use.

KWMI stated that the Puc 906.01(a)(3) testing requirement was proposed to complement the UL 1741 and IEEE 929 standards in place at the time of adoption. It is KWMI's understanding that the national IEEE 929 surge testing standards would be adopted as part of the PUC 900 rules. According to KWMI, since the adoption of Puc 900, IEEE has voted to adopt the

new IEEE 1547 standard, which will address the surge testing requirements that were to be addressed by the changes to IEEE 929.

KWMI stated that the safety of utility personnel and the public as well as the distribution system is of primary concern.

KWMI proposed the following:

1. Maintain a list of "type accepted" inverters at either the PUC website or at each utility's website. The list would include the Xantrex SW series inverters with GTI units, the AES GC 1000 inverter, and the Xantrex BWT 10240 inverter, all of which are currently accepted by PSNH.
2. Review and amend larger market lists of "type accepted" equipment such as the New York Public Service Commission's type tested and approved equipment list.
3. Adopt the IEEE 1547 standard for interconnection distributed resources with electric power systems in place of Puc 906.01(a)(3).

Solar Works submitted a late filed letter to the Commission on February 28, 2003. Solar Works echoed the general comments of GRO and KWMI. Solar Works stated that the list of acceptable inverter equipment has grown even smaller because Advanced Energy is out of business. According to Solar Works, their GC-1000 inverter was one of the few to pass the New Hampshire requirement. Solar Works recommended specifically that Puc 906.01(a)(3) be amended to state that if an inverter manufacturer has passed the same surge testing requirements required by New York, then the equipment shall be deemed

acceptable in New Hampshire. Solar Works states that New York is a very large market and all of the inverter manufacturers are performing tests that meet the New York requirements.

III. COMMISSION ANALYSIS

The commenters generally agreed on the importance of renewable energy resources and the protection of public safety and the distribution system. In fact, those comments are consistent with the purpose section of the Limited Electrical Energy Producers Act, RSA 362-A, which provides as follows:

"It is found to be in the public interest to provide for small scale and diversified sources of supplemental electrical power to lessen the state's dependence upon other sources which may, from time to time, be uncertain. It is also found to be in the public interest to encourage and support diversified electrical production that uses indigenous and renewable fuels and has beneficial impacts on the environment and public health. It is also found that these goals should be pursued in a competitive environment pursuant to the restructuring policy principles set forth in RSA 374-F:3. It is further found that net energy metering for eligible customer-generators may be one way to provide a reasonable opportunity for small customers to choose interconnected self generation, encourage private investment in renewable energy resources, stimulate in-state commercialization of innovative and beneficial new technology, enhance the future diversification of the state's energy resource mix, and reduce interconnection and administrative costs. However, due to uncertain cost and technical impacts to electric utilities and other ratepayers, the general court finds it appropriate to limit the availability of net energy metering to eligible customer-generators who are early adopters of small-scale renewable electric generating technologies."

The utilities and the renewable energy interests disagree about whether PUC 906.01(a)(3) is unnecessarily

stringent.

Pursuant to N.H. Code Admin. Rules Puc 906.01, single-phase or three-phase inverter equipment connecting a net energy metered project to the electric grid must comply with (1) the "IEEE Recommended Practice for Utility Interface of Residential and Intermediate Photovoltaic (PV) Systems, ANSI/IEEE STD 929-2000" issued by the Institute of Electrical and Electronic Engineers, Inc.; (2) the "UL 1741, Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems", issued by Underwriters Laboratories, Inc., May, 1999; and (3) certain surge testing requirements, see Puc 906.01(a)(3) and (b), as follows:

- (1) Location category B;
- (2) Exposure level, medium;
- (3) Test waveforms, 100 kHz ring wave, peak amplitude 4kV and 0.33kA;
- (4) Test waveforms, combination wave, peak amplitude 4kV and 2 kA;
- (5) Coupling modes shall be line to neutral, and line and neutral to ground;
- (6) Test modes shall be as follows:
 - a. In mode one, the unit connected, delivers rated output power;
 - b. In mode two, the unit connected, delivers zero output power;
- (7) Repetition, three applications of each surge condition with one minute between surges and both polarities tested for the combination wave;
- (8) Pass criteria shall conform to the following:

a. Test mode one, in which:

1. The unit continues to run normally with no alteration in running or protection function;
2. The unit shuts down but can restart and run normally with no alteration in running or protection function; or
3. The unit cannot restart; and

b. Test mode two, in which:

1. The unit can start and run normally with no alteration in running or protection function; or
2. The unit cannot start."

PSNH has accepted the Xantrex GridTek 10kW inverter under the model name, Xantrex BWT-10240, thus apparently mooting the need to decide the waiver request for this inverter. Even if Advanced Energy Systems is out of business, that would not necessarily mean that the waiver request for the GC 1000 and GC 3000 inverters is completely moot since these inverters may still be available for sale. Finally, the waiver request for the Xantrex Sun Tie Series (1.5kW, 2.5kW) may not be moot in spite of GRO's assertion that the "Xantrex Sun Tie inverter" has been tested and submitted for approval. If that were true, KWMI could be expected to have mentioned that fact in its comments. However, KWMI did not do so.

We find the record does not contain sufficiently reliable information indicating that a waiver for the specified inverter equipment is justified. (As noted above, the request

regarding the Xantrex GridTek 10kW inverter does, however, appear to be moot.) Under PUC 201.05, the Commission shall waive a rule as being in the public interest if (1) compliance would be onerous given the circumstances of the affected person and (2) the purpose of the rule may be satisfied by an alternative method presented. Although KWMI has asserted that compliance would be onerous, it has not clearly shown that the purpose of PUC 906.01(a)(3) is satisfied by an alternative method presented that does not in effect require revision of the rule. Nevertheless, we believe that KWMI's first and third suggestions are worth considering in a rulemaking docket.

Regarding web site posting of acceptable inverter equipment (KWMI's first suggestion), from a policy perspective, it should be easy to identify the inverters which have been found to be acceptable. Consistent with the approach in the PUC 900 rules which emphasizes utility-consultant cooperation in implementing the rules, the lists would be maintained by the utilities. If the utilities' lists turn out to be different from one another, then information can be shared that should normally resolve the discrepancies, without the necessity of intervention by the Commission.

Regarding the adoption of IEEE 1547 to replace Puc 906.01(a)(3) and (b) (KWMI's third suggestion), CVEC advises that the IEEE 1547 standards incorporate voltage and current surge testing requirements and that these standards are "reflected in" PUC 906.01(a)(3). According to KWMI, the IEEE 1547 standards

have recently been adopted.

To the extent that New Hampshire's surge testing requirements are similar to but different than the IEEE 1547 standards, the adoption of a widely accepted set of national standards is an idea worth considering, particularly if they are no less strict than the intent of PUC 906.01(a)(3). Thus we will open a rulemaking docket to consider this idea. Given that New Hampshire is a small market for inverters, it may not make sense to limit the market by preserving a rule that is unnecessarily and unreasonably different from substantially similar national standards.

In addition, the advantages or disadvantages of having the rules refer to a testing standard published on a particular date, as PUC 906.01(a)(1), (2) is an issue worth addressing if periodic updates to the standards may necessitate repeated rule amendments.

KWMI's second suggestion, supported by Solar Works, to piggyback off New York's inverter list, is a possibility but it is less clear that it is an idea worth pursuing.

A review of the testimony and comments in DRM 99-068, the docket in which the Commission adopted the Puc 900 rules, is instructive because many of the commenters in the present docket were involved in that docket and the surge testing issue was discussed at length in that docket. It is apparent that the issue is still a contentious one.

With one exception,² the Initial Proposal of Puc 906.01 was similar to the version finally adopted. Solar Works testified that Puc 906.01(b)(3) and (4) were additional requirements not included in the IEEE requirements incorporated by reference in Puc 906.01(a). Transcript of Hearing on September 22, 2000 (Tr.) at 35 and 58. Solar Works stated that these two requirements were not part of the requirements of Maine, Massachusetts or Vermont.

KWMI testified that the reasoning behind the additional tests was that PSNH engineers felt that the UL standards were not strict enough. Tr. at 52, 60. However, KWMI said that the references that were included (*i.e.*, in PUC 906.01(b) of the Initial Proposal) were part of the published IEEE standards. Tr. at 53.

PSNH agreed with KWMI that the requirements set forth in PUC 906.01(b) were a subset of those referred to in PUC 906.01(a)(3). Tr. at 55-56. PSNH also said there was some support in the industry to incorporate the surge tests into UL

² Puc 906.01(a)(3) and (b) of the Initial Proposal read:

"(a)(3) The surge testing requirements set forth in the standards issued by the American National Standards Institute and the [IEEE]...titled as follows:

a. Standard C-62.41-1991, titled, 'IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits' published October 11, 1991; and

b. Standard C-62.45-1992, titled, 'IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits', published in 1992.

(b) The portion of the surge testing of electrical equipment standards referred to in (a)(3) above that shall be applicable to inverter interfaced systems, shall be as follows: [with two minor revisions, the remainder of (b) was not changed in the finally adopted rules]."

1741 so that surge testing will be done on a national basis.

GSEC said that the purpose of specifying "wave forms" (see Puc 906.01(b)) is to simulate what a surge from a lightning strike looks like. Tr. at 56. GSEC stated that Solar Works was talking about the "type testing" requirements of New York State, which were different than those proposed in New Hampshire. Tr. at 59. GSEC's comments seem to confirm PSNH's statement to the effect that PUC 906.01(b) was a subset of requirements referred to in PUC 906.01(a)(3). Tr. at 59. GSEC also said that UL 1741 is referenced in IEEE 929-2000. Tr. at 62-63.

Staff said it understood that the surge testing requirement included in the Initial Proposal was in the process of being incorporated into the two national standards. Staff said it thought it was merely anticipating a future change. Tr. at 62.

According to Solar Works, "type testing" involved the preliminary approval of a device for use under certain conditions. Regarding the surge testing issue under discussion, Solar Works further testified:

"So, it really becomes a matter, I think as [GSEC] suggested, of whether the national standard will come up to speed and adopt the recommendations and when that will be, and whether New Hampshire should wait until that national process is concluded or whether it should create its own set of rules anticipating these changes, but still its own set of rules, and what impact that has on the installation of solar systems in the state." Tr. at 63.

Solar Works agreed with GSEC that the devices should be tested for safety in the event of a lightning strike. Tr. at 64.

In light of these differing views, we believe the best course of action is to open a new rulemaking docket to investigate and consider amending the net energy metering rules in respect to the matters discussed above. We believe this will be more efficient than considering rule waiver requests on a case-by-case basis.

Based upon the foregoing, it is hereby

ORDERED, that KWMI's letter petition is denied; and
it is

FURTHER ORDERED, that a new rulemaking docket be opened to investigate and consider amending the net energy metering rules in respect to the matters discussed above.

By order of the Public Utilities Commission of New
Hampshire this twenty-seventh day of June, 2003.

Thomas B. Getz
Chairman

Susan S. Geiger
Commissioner

Nancy Brockway
Commissioner

Attested by:

Michelle A. Caraway
Assistant Executive Director